

REMARKS

Claims 13 and 16-23 are pending in this application. By the Office Action, claims 13 and 16-23 are rejected under 35 U.S.C. §103, and for obviousness-type double patenting.

Applicants thank the Examiner for the indication that the previous rejections have been withdrawn.

II. Rejections Under §103

A. Kawasumi in View of EP 763 532

Claim 23 is rejected under 35 U.S.C. §103(a) as having been obvious over Kawasumi in view of EP 763 532. Applicants respectfully traverse this rejection.

Independent claim 23 is directed to a device consisting of: a pair of electrodes; a liquid crystal material filled into a gap between said electrodes, the liquid crystal material comprising a rod-shape liquid crystal compound, said liquid crystal material having a property such that charge-transport properties are varied according to a phase transfer between a plurality of stable liquid crystal phases of the liquid crystal and/or a history of the phase transfer, the phase transfer of the liquid crystal material occurring upon a change in temperature of the liquid crystal material between a crystalline phase at a room temperature to an isotropic phase in a final state through a smectic phase at an elevated temperature, and a thickness of the gap between the electrodes being smaller than a domain size of the liquid crystal compound in a cooled state from the isotropic phase in a final state; and the device is configured so that information can be recorded by application of thermal energy to an area of the device, and recorded information can be read by detecting a value of photoelectric current generated by light applied to the area of the device at which information was recorded. Such a device is nowhere taught or suggested by the cited references.

Kawasumi is cited as disclosing the claimed device, except for the use of the liquid crystal as claimed. EP 763 532 is then cited as disclosing the liquid crystal, and the Office

Action argues that it would have been obvious to use the liquid crystal of EP 763 532 in the device of Kawasumi to practice the claimed invention. Applicants respectfully disagree. Specifically, neither reference teaches or suggests at least the feature of the claimed invention that the device is configured so that information can be recorded by application of thermal energy to an area of the device, and recorded information can be read by detecting a value of photoelectric current generated by light applied to the area of the device at which information was recorded. This feature of the claimed invention is provided by a combination of the claimed liquid crystal and the claimed structure, and would not have been obvious over the cited references.

Kawasumi only discloses a specific liquid crystal composition that comprises a non-polymeric liquid crystal and a second substance dispersed therein. The second substance is a substance having affinity for the liquid crystal and being composed of particles having a particle size and an aspect ratio of a predetermined value or greater. Kawasumi at Abstract. For example, the second substance can be layered clay minerals, titanium oxide, alumina white (water-insoluble basic aluminum sulfate), calcium carbonate, flaky zinc oxide, flaky aluminum, Berlin blue, hematite oxides, and graphite, as well as the plate-like crystals of various types of ceramics. Also usable are those of organic crystals and organic metal complexes. Col. 20, lines 3-10.

Kawasumi does not teach or suggest the use of charge-transport properties of the liquid crystal itself as in the claimed invention, where the information recording device is configured so that information can be recorded by application of thermal energy to an area of the device, and recorded information can be read by detecting a value of photoelectric current generated by light applied to the area of the device at which the information was recorded. Kawasumi also fails to teach or suggest the specific claimed structure, particularly the

specific relationship between the thickness of the gap between the electrodes and the domain size of the liquid crystal compound between two states of an initial state and a cooled state.

The Office Action also cites EP 763 532 as disclosing an information recording medium comprising a substrate, a pair of electrodes, and a liquid crystal charge transfer material filled into a gap between the electrodes, as shown in Fig. 1. The Office Action particularly cites EP 763 352 as disclosing a liquid crystal material made from 2-(4'-heptyloxyphenyl)-6-dodecylthiobenzothiazole). The Office Action thus concludes that it would have been obvious to use the liquid crystal material of EP 763 532 in the device of Kawasumi. Applicants respectfully disagree.

The cited references, in any combination, at least fail to teach or suggest the claim limitation that the device is configured so that information can be recorded by application of thermal energy to an area of the device, and recorded information can be read by detecting a value of photoelectric current generated by light applied to the area of the device at which information was recorded. Neither Kawasumi nor EP 763 532 teach or suggest at least this feature and do not teach or suggest how or even if Kawasumi could be modified to operate in this manner.

Furthermore, the references do not teach or suggest the claim limitation that the thickness of the gap between the electrodes being smaller than a domain size of the liquid crystal compound in a cooled state from the isotropic phase in a final state, as defined in claim 23. As to this feature, the Office Action merely asserts that "since the device of Kawasumi as modified by EP '532 comprises the same liquid crystal material and the gap between the electrodes having a thickness within the range as disclosed in the present specification, it is the Examiner's position that the thickness of the gap between the electrodes would be inherently smaller than a domain size of the liquid crystal compound in a cooled state." However, this basis for a rejection is improper.

First, the Office Action fails to provide the proper reason or rationale, as discussed above, for even combining the two references in the first instance. Second, the Office Action nowhere explains why one of ordinary skill in the art would not have increased the thickness of the gap between the electrodes in Kawasumi to accommodate the materials of EP 763 352. Not all display devices are configured to have these relationships between the thickness of the gap and the domain sizes of the liquid crystal compound between the two (initial and cooled) states, and the mere provision of a gap between the electrodes with a liquid crystal charge material filled into the gap, does not inherently or obviously provide a device having the recited claim limitations. The only stated reason for maintaining a smaller thickness of the gap, is because it is within the range "disclosed in the present specification" - a reason that is clearly based only on improper hindsight and reconstruction of the claimed invention based on Applicants' own teachings. This feature is not taught or suggested by the cited references, and therefore would not have been obvious to one of ordinary skill in the art.

For at least these reasons, any combination of the cited references would not have rendered obvious the claimed invention. One of ordinary skill in the art, seeking to improve upon the devices of Kawasumi, would not have been motivated to look to the teachings of EP 763 532. Nor would one of ordinary skill in the art have been motivated to take the combination of Kawasumi and EP 763 532, and modify the resultant combination to provide a device where information recording is conducted by the application of thermal energy, and where there is the specific relationship between the gap thickness and the domain sizes of the liquid crystal in the initial and cooled states, as claimed.

For at least these reasons, claim 23 would not have been obvious over the cited references. Reconsideration and withdrawal of the rejection are respectfully requested.

B. JP 61-280046 in View of EP 763 532 and Kawasumi

Claims 13 and 16-22 are rejected under 35 U.S.C. §103(a) as having been obvious over JP 61-280046 in view of EP 763 532 and Kawasumi. Applicants respectfully traverse this rejection.

Independent claim 13 is directed to an information recording medium consisting of: a pair of electrodes; and a liquid crystal material filled into a gap between said electrodes, the liquid crystal material comprising a rod-shape liquid crystal compound; wherein the liquid crystal material has a property such that charge-transport properties are varied according to a phase transfer between a plurality of stable liquid crystal phases of the liquid crystal and/or a history of the phase transfer, the phase transfer of the liquid crystal material occurring upon a change in temperature of the liquid crystal material between a crystalline phase at a room temperature to an isotropic phase in a final state through a smectic phase at an elevated temperature; the liquid crystal material comprises a material selected from the group consisting of a phenylbenzothiazole liquid crystal, 4-hexyloxy-4-butanoylbiphenyl, and a phenylnaphthalene liquid crystal wherein the phenylnaphthalene is one selected from the group consisting of 2-(4'-octylphenyl)-6-butyloxynaphthalene, 2-(4'-octylphenyl)-6-nonyloxynaphthalene and a mixture thereof; a thickness of the gap between the electrodes is larger than a domain size of the liquid crystal compound at least in the initial state of the liquid crystal material, and the thickness of the gap between the electrodes being smaller than a domain size of the liquid crystal compound in a cooled state from the isotropic phase in a final state; and the information recording medium is configured so that information can be recorded by application of thermal energy to an area of the medium, and recorded information can be read by detecting a value of photoelectric current generated by light applied to the area of the medium at which information was recorded. Independent claim 21 is directed to an information recording medium consisting of: a pair of electrodes, wherein the pair of

electrodes is provided on a substrate; and a liquid crystal material filled into a gap between said electrodes, the liquid crystal material comprising a rod-shape liquid crystal compound; wherein the liquid crystal material has a property such that charge-transport properties are varied according to a phase transfer between a plurality of stable liquid crystal phases of the liquid crystal and/or a history of the phase transfer, the phase transfer of the liquid crystal material occurring upon a change in temperature of the liquid crystal material between a crystalline phase at a room temperature to an isotropic phase in a final state through a smectic phase at an elevated temperature; the liquid crystal material comprises a material selected from the group consisting of a phenylbenzothiazole liquid crystal, 4-hexyloxy-4-butanoylbiphenyl, and a phenylnaphthalene liquid crystal wherein the phenylnaphthalene is one selected from the group consisting of 2-(4'-octylphenyl)-6-butyloxynaphthalene, 2-(4'-octylphenyl)-6-nonyloxynaphthalene and a mixture thereof; a thickness of the gap between the electrodes is larger than a domain size of the liquid crystal compound at least in the initial state of the liquid crystal material, and the thickness of the gap between the electrodes being smaller than a domain size of the liquid crystal compound in a cooled state from the isotropic phase in a final state; and the information recording medium is configured so that information can be recorded by application of thermal energy to an area of the medium, and recorded information can be read by detecting a value of photoelectric current generated by light applied to the area of the medium at which information was recorded. Such an information recording medium is nowhere taught or suggested by the cited references.

EP 763 532 and Kawasumi are discussed in detail above. The Office Action cites JP 61-280046 as disclosing all of the limitations of the claimed invention, except a thickness of the gap between the electrodes, and the specific liquid crystal as claimed. The Office Action argues that EP 763 532 discloses the specific liquid crystal, and Kawasumi discloses the

thickness of the gap, and that it would have been obvious to combine all three references to practice the claimed invention. Applicants disagree.

First, JP 61-280046 is directed to an optical recording medium that is different in operation and use from the device of the claimed invention. Particularly, JP 61-280046 is directed to specific liquid crystal compositions that mainly utilize electro-optical properties. However, the claimed device does not utilize such electro-optical properties. Instead, the claimed invention utilizes charge-transport properties of the liquid crystal itself, where the information recording device is configured so that information can be recorded by application of thermal energy to an area of the device, and recorded information can be read by detecting a value of photoelectric current generated by light applied to the area of the device at which the information was recorded. Nowhere do any of the references teach or suggest that the materials of EP 763 532 and/or Kawasumi could or should be substituted for the materials of JP 61-280046, and the resultant optical recording medium could or should be modified to operate by the different principle as claimed.

Second, even if combined, the Office Action's assertion with respect to the relationship between the thickness of the gap between the electrodes and the domain size of the liquid crystal material in a cooled state, is misplaced and improper. As described above, the Office Action fails to provide the proper reason or rationale for even combining EP 763 532 and Kawasumi in the first instance, and nowhere explains why one of ordinary skill in the art would not have increased the thickness of the gap between the electrodes in Kawasumi to accommodate the materials of EP 763 352. Instead, the only reason for maintaining a smaller thickness of the gap, is because it is within the range "disclosed in the present specification" - a reason that is clearly based only on improper hindsight and reconstruction of the claimed invention based on Applicants' own teachings.

Accordingly, the references are improperly combined, and even if combined would still not have provided the claimed invention. The references thus would not have rendered obvious the claimed invention.

For at least these reasons, claims 13 and 16-22 would not have been obvious over the cited references. Reconsideration and withdrawal of the rejection are respectfully requested.

C. JP 61-280046 in View of Kawasumi

Claim 23 is rejected under 35 U.S.C. §103(a) as having been obvious over JP 61-280046 in view of Kawasumi. Applicants respectfully traverse this rejection.

Claim 23, and the references JP 61-280046 and Kawasumi, are discussed in detail above. For similar reasons, any combination of JP 61-280046 and Kawasumi would not have rendered obvious the claimed invention.

JP 61-280046 is cited as disclosing all of the limitations of the claimed invention, except a thickness of the gap between the electrodes. The Office Action argues that Kawasumi discloses this feature, and that it would have been obvious to combine JP 61-280046 and Kawasumi to practice the claimed invention. Applicants disagree.

JP 61-280046 is directed to an optical recording medium that is different in operation and use from the device of the claimed invention. Particularly, JP 61-280046 is directed to specific liquid crystal compositions that mainly utilize electro-optical properties. However, the claimed device does not utilize such electro-optical properties. Instead, the claimed invention utilizes charge-transport properties of the liquid crystal itself, where the information recording device is configured so that information can be recorded by application of thermal energy to an area of the device, and recorded information can be read by detecting a value of photoelectric current generated by light applied to the area of the device at which the information was recorded.

Accordingly, any combination of the optical recording medium of JP 61-280046 with the gap of Kawasumi, still would not provide either the structure or the operation of the claimed device. Nowhere does either reference teach or suggest that the two references could or should be combined, and then further modified so as to provide the claimed invention.

For at least these reasons, claim 23 would not have been obvious over the cited references. Reconsideration and withdrawal of the rejection are respectfully requested.

D. JP 09-185043 in View of EP 763 532

Claim 23 is rejected under 35 U.S.C. §103(a) as having been obvious over JP 09-185043 in view of EP 763 532. Applicants respectfully traverse this rejection.

Claim 23 and EP 763 532 are discussed in detail above. For similar reasons, any combination of JP 09-185043 and EP 763 532 would not have rendered obvious the claimed invention.

JP 09-185043 is cited as disclosing all of the limitations of the claimed invention, except the use of a liquid crystal having a rod shape. The Office Action argues that EP 763 532 discloses this feature, and that it would have been obvious to combine JP 09-185043 and EP 763 532 to practice the claimed invention. Applicants disagree.

JP 09-185043, like JP 61-280046, is directed to an optical recording medium that is different in operation and use from the device of the claimed invention. Particularly, JP 09-185043 is directed to specific liquid crystal compositions that mainly utilize electro-optical properties. However, the claimed device does not utilize such electro-optical properties. JP 09-185043 fails to teach or suggest an optical recording medium that utilizes charge-transport properties of the liquid crystal itself, where the information recording device is configured so that information can be recorded by application of thermal energy to an area of the device, and recorded information can be read by detecting a value of photoelectric current generated by light applied to the area of the device at which the information was

recorded. Thus, any combination of JP 09-185043 with EP 763 532 would not have provided an optical recording device having this property.

Accordingly, any combination of the optical recording medium of JP 09-185043 with the rod shaped liquid crystal of EP 763 532, still would not provide either the structure or the operation of the claimed device. Nowhere does either reference teach or suggest that the two references could or should be combined, and then further modified so as to provide the claimed invention.

For at least these reasons, claim 23 would not have been obvious over the cited references. Reconsideration and withdrawal of the rejection are respectfully requested.

III. Rejections for Obviousness-Type Double Patenting

Claims 13, 16-17, and 19-23 are rejected for obviousness-type double patenting over claims 1-13 of U.S. Patent No. 6,174,455 in view of Kawasumi.

Claim 18 is rejected for obviousness-type double patenting over claims 1-13 of U.S. Patent No. 6,174,455 in view of Kawasumi and further in view of EP 763 532.

Claims 13, 16-17, and 19-23 are rejected for obviousness-type double patenting over claims 1-13 of U.S. Patent No. 6,720,039 in view of Kawasumi.

Claim 18 is rejected for obviousness-type double patenting over claims 1-13 of U.S. Patent No. 6,720,039 in view of Kawasumi and further in view of EP 763 532.

Claims 13 and 16-23 are rejected for obviousness-type double patenting over claims 1-13 of U.S. Patent No. 6,224,787 in view of Kawasumi.

Claims 13 and 16-23 are rejected for obviousness-type double patenting over claims 1-13 of U.S. Patent No. 6,218,061 in view of Kawasumi.

Although Applicants do not necessarily agree with these rejections, in the interest of advancing prosecution a Terminal Disclaimer over all of U.S. Patents Nos. 6,174,455, 6,720,039, 6,224,787, and 6,218,061 is filed herewith. Accordingly, the rejections are

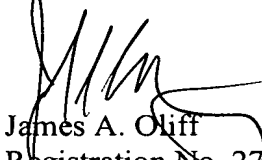
overcome and should be withdrawn. Reconsideration and withdrawal of the rejections are respectfully requested.

III. Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of the application are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,


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Attachment
Terminal Disclaimer

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